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A Conceptual Framework and Empirical Analysis

IS outsourcing policies define the criteria that organizations utilize to decide upon the scope and degree of reliance of their IS capabilities upon external sources. Financial considerations and business strategy are the two major determinants of the IS outsourcing decision. Most controversy on outsourcing of IS has been around the issue of increasing performance - generally by reducing costs and improving service. In this context, the study of the interrelationships between IS outsourcing policy, the business and financial strategy considerations and IS productivity, is increasingly relevant for providing a more balanced perspective to the ongoing debate.

This paper proposes an integrative conceptual framework for analyzing the above relationships. A structural equation model was created to represent the proposed conceptual framework. The model was operationalized by using factor analysis and stepwise regression analyses. Since the objective of the study was to investigate the influence of financial criteria and business strategy variables on IS performance, the set of companies selected as "the 100 most effective users of information technology" by Computerworld Premier 100 survey (1994) represents an acceptable sample. Data integrity was ensured by extracting all remaining data from the same public sources as those used by the survey. The study has important implications for the new measure of IS productivity, as well as the continued emphasis on primarily macro-level financial measures for determining the effectiveness of IS.

1. Conceptual Framework for the Proposed Model

The proposed conceptual framework has two motives: (i) to assess the influence of

Business Strategy and Financial Conditions on IS Outsourcing Policy, (ii) to evaluate the relative importance of Financial Considerations and IS Outsourcing Policy as determinants of IS Productivity. The first objective is characterized by:

$$OP = f(B,F) \quad (1)$$

where the symbols denote vectors with components representing IS Outsourcing Policies (OP), Business Strategy (B), Financial Conditions (F), and f denotes "function of." The other objective is represented by:

$$ISP = g(F,OP) \quad (2)$$

where the components of ISP represent IS productivity, and those of F and OP are as described in Table 1, and g denotes "function of." The two objectives are integrated in the model delineated in Figure 1.

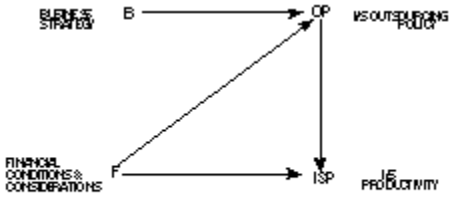

Figure 1. Conceptual Framework for the Proposed Model

The endogenous and exogenous variables, and their corresponding indices, of the conceptual model are listed in Table 1.

Table 1. Variables Used in this Study and their Units of Measurement

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Note: In the following table, the Variables are represented by the INDICES listed under them.
Subcategories of indices presented under some variables are based on theory and intuition.

ENDOGENOUS VARIABLES

IS Outsourcing Policy (OP)
Criteria used by organizations to decide upon the scope of their dependence upon outside IS vendors
for meeting their needs.
ISOUT % IS Budget Spent Outside IS Department

IS Productivity (ISP)
Return from investments in IS.
IPI (Information Productivity Index)

EXOGENOUS VARIABLES

Financial Considerations (F)
Financial conditions of the company that may affect allocation of capital
and cost-cutting measures for different functions.

Business cost structure
CSSA (Cost of Goods Sold+Selling, General & Administrative Expenses)/Sales
CSTA (Cost of Goods Sold+Selling, General & Administrative Expenses)/Total Assets

Financial leverage
LDSE Long-term Debt/Shareholders' Equity
TLSE Total Liabilities/Shareholders' Equity Business performance
REOA Return on Assets
EAPS Earnings Per Share ($)

Technology cost structure
ITGP IT Expenditure/Gross Plant, Property & Equipment
ITNP IT Expenditure/Net Plant, Property & Equipment Return on Technology
NIIT Net Income/IT Expenditure
SAIT Sales/IT Expenditure

Business Strategy (B)
Strategic significance of the IS function in the company.

Relative Importance of IS
ISBDGT IS Budget as % of Revenue
BDGTCHG Growth in IS Budget (% over last 5 years)
ISPEMP Total Number of IS Staff/Total Number of Employees

Strategic Position of IS within firm
TOCEO Categorical variable to indicate if CIO reports directly to CEO or president of the firm.
TOCFO Categorical variable to indicate if CIO reports to a finance executive (to determine bias towards Financial Considerations)

ISOUT represents IS Outsourcing Policy (OP) - higher ISOUT implies lesser reliance on internal IS department and greater reliance on external sources: both inside as well as outside the organization. IS Productivity is measured by the "Information Productivity Index" (or IPI) as presented in the table of Computerworld Premier 100. IPI, which has been described as a better measure of IS productivity than more traditional measures, is expected to represent the return on management of IS (Strassmann 1990,1994).

1 A. Structural Form of the Model

The structural model is based upon the equations (1) and (2) defined before.

$$OP = A0 + A1*F + A2*B \quad (3a)$$
$$ISP = B0 + B1*F + B2*OP \quad (3b)$$

where,

OP = Outsourcing Policy (Endogenous Explanatory)
ISP = IS Performance (Endogenous)
F = Financial Considerations (Exogenous) B = Business Strategy (Exogenous)
Ai = Parameters that are assumed to have specific values
Bi = Parameters that are assumed to have specific values.

2. Determination of Indices to Be Used in the Analysis

Factor analyses was used to determine the underlying dimensions of exogenous variables F and B. Table 2 exhibits the summary of data and indices obtained from the factor analysis done for determining the underlying indices.

Table 2. Data and Indices Obtained by Factor Analysis

	Factor Analyses		
Data	Reference		Index
Financial Considerations(F)			
Return on Technology	A		Performance index
NIIT			
SAIT			
Technology cost structure			
ITGP			
ITNP			
LDSE			
EAPS	A		Long-term index
Business cost structure	A		Business cost index
CSSA			
CSTA			
REOA			
TLSE	A		Short-term index
Business Strategy(B)			
Strategic Position of IS	B		Position index
TOCEO			
TOCFO			
Relative Importance of IS	B		Competitive index
ISBDGT			
BDGTCHG			
ISPEMP			

Factor analysis (Reference A) of the ten indices for Financial Considerations listed in Table 1 reveals that four factors together explain 68.1 percent of the total variance. While the first and third factors represent the subcategories of return on technology and business cost structure, the second factor represents the longterm effect of IT investments on financial performance, and the fourth factor explains the link between increased total liabilities and corresponding decrease in return on assets [due to investments in IT], and hence represents the short-term effect of IT investments on financial performance.

Factor analysis (Reference B) of the five Business Strategy indicators supports their categorization into the two classes that were based on intuition.

3. Two Stage Least Squares Method for Determining the Parameters of the Structural Equations

Two stage least squares method was used to determine the parameters of the structural equations. Ordinary stepwise regression was done on the equations of the reduced model. Parameters from this regression were then used to derive the estimated values (EISOUT) of the endogenous explanatory variable (ISOUT index of the OP variable). The estimated values were used for the next stepwise regression to determine the parameters of the structural equation (3b) for the other endogenous (non-explanatory) variable.

Tables 3 and 4 depict the results of the two regression analyses. In both cases, the F-value suggests that the regression is significant at .01 significance level. The R-square values indicates that in both regressions over twelve percent variance is explained by the explanatory variables.

Table 3: Determinants of IS Outsourcing (ISOUT)

Explanatory Variables a,b,c	Explained Variable: % IS Budget Spent Outside IS Department
R-Square	.1421
F valuec	[2,72] 5.96
Sig F	.004
Constant	138.93
A. Financial Considerations	
Performance	91.23 (1)
Business cost	-77.50 (2)

a Only the explanatory variables selected by stepwise method up to the 0.05 level of significance are included in this table

b For each variable, data are values of the regression coefficients; numbers in parentheses indicate step when entered into the corresponding regression.
c Values in brackets are corresponding degrees of freedom for F coefficient of the equation.

Table 4: Determinants of IS Productivity (IPI)

Explanatory Variables a b	Explained Variable: Information Productivity Index
R-Square	.1210
F valuec	[2,81] 5.574
Sig F	.005
Constant	.2775
A. Financial Considerations	
Business cost	-.068086 (1)
Short-term	-.056296 (2)

a b c Same as for Table 3

Results in Tables 3 & 4 suggest the relative importance of Financial Considerations in determining the IS Outsourcing Policy and the firm's IS Productivity. Of the Financial Considerations, performance seems to positively influence the IS outsourcing decisions, while higher business cost structure has a negative effect. Business Strategy considerations do not seem to influence IS Outsourcing Policy. Further, IS Outsourcing Policy does not seem to have any direct influence on IS Productivity. However, these results could have been influenced by the limitations inherent in this kind of study.

4. Conclusion

Limitations: Considering the fact that this is the first study of its kind which is based on data that is available for only one year, several limitations must be observed. Firstly, interactions between the various variables were ignored. Secondly, since IPI and other related measures have only been used recently for Computerworld rankings, a longitudinal study was not feasible. Thirdly, within the scope of this study, the data for IS budget spent outside IS department was used as a surrogate for the IS Outsourcing Policy. Any delays between the allocation of IS budget and the resulting effect on IS performance were not considered for analysis. Finally, it is difficult to ascertain the

generalizability of this study to companies that were not in the Premier 100 list.

The results of the study are interesting in several respects. First, based on the results, it can be argued that the new measure of IS performance used by Computerworld, although intended to give due emphasis to management of IS, hasn't adequately addressed its objective. Second, inconsequential significance of the Business Strategy indices could be attributed the indirect influence of IS investment on the organizational IS performance measures such as IPI. One approach for overcoming this limitation could involve using mediating variables that could represent process-level or function-level contribution of the IS function. A second approach could involve comparison of the market value of the IS function with alternative [internal or external] options available to the organization. Further research in IS outsourcing can reveal more reliable and valid findings by taking into consideration the findings of this study and the limitations mentioned herein.